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Summary

THIS STUDY IS related to the general topic of “returns” on an investment in human capital. Human capital is typically viewed as an asset which is acquired by an individual in the form of investment in training, health, information about markets, et cetera. The asset is embedded in the individual and yields a flow of productive services jointly with the use of his available time. Considerable evidence suggests a positive relationship between the level of one’s stock of human capital—measured, say, by years of schooling—and one’s level of earnings. From this relationship the monetary returns through the labor market are estimated.

If human capital yields a flow of productive services with manhours in the labor market, it may also yield a flow of services jointly with the time spent in other activities. Certain examples seem obvious: Some education yields productive services jointly with time spent reading books or balancing a checkbook; some improvements in health yield productive services jointly with time spent participating in sports; some investment in information about local markets yields productive services jointly with time spent shopping, and so forth. If general forms of human capital yield such services jointly with time spent outside the labor market (in the “nonmarket” sector), these services should also be considered as a “return” on the investment in human capital. These are the returns on which this study focuses.

The theory employs the concept of household production functions. The household is viewed as a small multiproduct firm in which its members’ nonmarket time is combined with purchased market goods and services to produce commodities. The household consumes all of its own production of these commodities and thereby derives its utility. This production of commodities in the nonmarket sector re-

sponds to changes in the household's income and relative prices in the same manner as production of goods in the market sector responds to changes in income and relative prices.

In this context, the effects of changes in human capital operate through the nonmarket production functions, altering the parameters of the functions or the effective level of direct inputs, and thereby affecting the efficiency with which nonmarket production takes place. If the change enhances productivity in the nonmarket sector, the consumption "return" on the human capital is said to be positive. The model explores in some detail the changes in relative prices of different commodities resulting from unequal (or nonneutral) effects of human capital on the productivity of nonmarket production functions. It also analyzes the effects on real full income of shifts in overall production efficiency.

Chapter 2 analyzes one form of human capital, education. It shows that if education has an equiproportionate (or technologically "neutral") effect on all the nonmarket production functions, relative prices of commodities will be unaffected, while the household's income in real terms will change proportionately. In order to implement the model empirically with available data, the assumption is made that education has such a neutral effect across all production functions in the nonmarket sector. With this assumption the direction and magnitude of the effect can be inferred from observed shifts in the derived demand for factors of production—such as market goods and services—without directly observing the commodities produced.

The primary empirical work involves estimating cross-sectional income-expenditure curves for various categories of total consumption. The explanatory variables are the household's total consumption expenditure (used as a measure of its permanent money income), the education of the head of the household, the age of the head, the family's size, and its geographical region (South-non-South). From these modified Engel curves the household's responses to changes in money income and to changes in education level are estimated for each of the consumption items studied. From these observed income and education elasticities, an estimate of the magnitude and direction of the effect of education on nonmarket productivity can be computed; that is, knowing the magnitude of the household's response to changes in its money income and the magnitude of the response to changes in its educational level, one can infer the corresponding change in income that would induce the observed response resulting from the edu-

cation change. The household is then said to behave as if its real income had changed by that corresponding amount, which is, in turn, attributed to education as its nonmarket productivity effect.

The principal data source was the Bureau of Labor Statistics' 1960-61 consumer expenditures survey. Chapter 4 used these data at a fairly broad level of aggregation to study the shifts in expenditure patterns over slightly more than a dozen consumption categories, as well as the shifts between the two broad categories of goods and services. For the goods-services dichotomy the evidence, interpreted by the model developed here, suggests that the effect of education on nonmarket productivity is a positive one. That is, the income elasticities indicate that, other things held constant including education, households with higher levels of income spend proportionately more of their total expenditure on services and that, other things held constant including money income, households with higher levels of education also spend proportionately more of their fixed total expenditure on services. Thus, those with more education behave as if they had more real income, despite the fact that their permanent money income is held constant. This is interpreted as evidence that the higher level of education enhances their capacity to produce useful commodities from a given level of factor inputs in the nonmarket sector.

The statistical analysis of the smaller categories of consumption—food at home, housefurnishings, clothing, and so forth—indicates that for ten of the fifteen items, the expenditures shift in the same manner with education as with money income. For the remaining items, or about 40 per cent of the total expenditure, the shifts are in opposite directions. Over the whole set of fifteen items, the average effect is a positive one regardless of how the effect is calculated, but the magnitude of the effect is small. By one measure (obtained from a weighted regression across items) the overall effect is $+0.08$ in elasticity terms, which implies that for a family whose head of the household has ten years of schooling and whose total family income is \$10,000 per year, an additional year of schooling would contribute the equivalent of \$80.00 through improved nonmarket efficiency. However, from another measure (obtained by imposing the neutrality constraint on the system of equations) the overall effect is about $+0.70$, which implies a consumption income effect that is considerably larger. By comparison, the effect of education on the total expenditure or money income was estimated to be about $+0.80$ in elasticity terms.

These estimates are crude, of course, and the results should not be

taken as more than “ball park” point estimates of the effect of education on income through the nonmarket sector. Using the level of schooling of the household’s head as the explanatory variable is itself only an approximation of the family members’ amount of education. Likewise, separate analyses within specific age intervals could more adequately identify the important interaction effects that may exist. An additional problem is suggested in Appendix B, which shows that certain measurement errors may impose a negative correlation on the income and education elasticities, biasing the implied productivity effect downward. Finally, the simplifying assumption of technological neutrality is imposed at some cost on a system which clearly reflects some non-neutrality. Despite this, the model appears relatively effective for predicting the observed effects of education on expenditure patterns. It offers an internally consistent interpretation of these effects, and the order of magnitude of the implied elasticity of consumption income seems intuitively plausible. Furthermore, additional estimates of this elasticity discussed in the text and appendices are corroborative.

Chapter 5 disaggregates the 1960 expenditure data into much finer detail and analyzes the expenditure patterns across forty-five consumption items. Here, too, the estimates of education’s effect on real full income through nonmarket productivity are positive, and when estimated by weighted regression across items, the elasticity estimate is again around $+0.10$. When the elasticity was estimated by iteration with the neutrality constraint imposed, the estimate was again around $+0.7$. The consistency of these estimates from the 1960 survey—whether based on fifteen or forty-five expenditure categories—is reassuring, since the permutations of functional forms, definitions of expenditure items, handling of zero expenditures, and so forth make it difficult to specify which estimate might be the most appropriate one.

Because of the difficulty in dealing with current expenditures on durable goods, the implied effect of education on real income was also estimated from a subset of thirty-five nondurable items taken from the forty-five just discussed. It was shown that biases related to durable goods expenditures could lower the estimate of education’s nonmarket productivity effect. The regression estimate obtained from the nondurables alone was, indeed, higher, at approximately $+0.35$. When the neutrality constraint was imposed, the iterative procedure implied an elasticity in the vicinity of $+0.50$.

Chapter 6 discusses three different pieces of evidence related to the model. The first is an analysis of expenditure patterns from the 1950

Bureau of Labor Statistics survey similar to the 1960 data. For this body of data fifteen expenditure categories were used, and the point estimate of the education effect on real income was $+ 0.05$, expressed as an elasticity. The second section of Chapter 6 offers the model's explanation for previously observed differences in consumption patterns among immigrants in Israel from two studies of Israeli family expenditure patterns. The third briefly looks at some evidence relating to the demand for children in the context of the model. In addition, Appendices C and D present further evidence from the 1960 and 1950 Bureau of Labor Statistics surveys on expenditure patterns, indicating the extent to which the overall results discussed in Chapters 4, 5, and 6 are influenced by (or insensitive to) some aspects of the empirical procedures followed. For example, the zero expenditures are deleted, the education variable is replaced by three education dummy variables, the current total consumption expenditure variable is redefined, and so forth, and various estimates are presented with these changes. The force of this additional evidence supports the estimate of a small positive effect of education on real income through the nonmarket sector, as discussed in Chapter 4 and Chapter 5.

It should be stressed that this paper offers just one explanation for the empirical observation that education has an influence on consumer behavior aside from its role in market earnings and that this influence is essentially a systematic one. The explanation (presented in the theoretical chapters) around which the empirical results are centered rests on the effect of education on the productivity of household production functions. Other interpretations of the observed shifts in expenditure patterns can, of course, be suggested and several are discussed throughout the study. One of these, for example, suggests that education shifts preferences in a specified manner, while another discusses the results in the context of the effects of changes in the price of time. Distinguishing empirically among these and other alternative models will be facilitated by additional evidence. The model developed here is limited by the data to implications obtained from a relatively simple analysis under conditions of technological neutrality. But by its nature the model emphasizes the importance of substitution effects that would result from any nonneutrality in nonmarket production; it may ultimately be in interpreting these effects that its relative advantage lies.

For the present, the model appears reasonably capable of predicting the observed effects of education on expenditure patterns without any ad hoc assumptions. (Indeed, an effort is made in the text to avoid

the temptation of explaining the nonneutral cases on an ad hoc basis.) More generally, the implications of the model in Chapter 1 are not limited to effects of education, or human capital, on consumption expenditure patterns. Not only are there analogous implications for time expenditures, for example, but the approach would also seem to be applicable to the study of any other variables that affect the environment in which nonmarket production takes place.